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The patient signed an informed consent allowing the use of medical information for this report and received information on the institution's policies regarding the Health Insurance Portability and Accountability Act.

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ABSTRACT

Background

Low back pain is a common condition encountered in physical therapy practice. Manual lumbar traction and therapeutic exercise are two of the most common treatments used by physical therapists in the treatment of low back pain, but there is limited research investigating the combined effects of these interventions on low back pain. The purpose of this case report was to investigate the effects of a combined therapy approach of manual lumbar traction and therapeutic exercise as part of a compressive physical therapy plan of care for treatment of low back pain.

Case Description

The patient was a 48-year-old female with low back pain. Lifting objects, squatting, and walking for long durations increased her pain. Her primary complaint was her inability to walk for long durations. Her primary goals for physical therapy included decreasing pain and increasing activity. Manual lumbar traction and therapeutic exercises were included in the comprehensive plan of care to improve functional mobility and decrease low back pain.

Outcomes

The patient demonstrated improvements in pain free range of motion, manual muscle testing scores, flexibility, tenderness with palpation, functional squatting, and pain levels on the Numeric Pain Rating Scale. The patient also met all of the plan of care long term goals.

Discussion

This case study demonstrated the use of manual lumbar traction and therapeutic exercise in the treatment of low back pain. Future research should emphasize generalizing results to a larger population, investigating greater and different outcome measures, and determining potential long term benefits of this treatment plan.

ABSTRACT WORD COUNT: 252

MANUSCRIPT WORD COUNT: 2,722

BACKGROUND and PURPOSE

The Centers for Disease Control and Prevention (CDC) reported that the percentage of adults ages 45-64 years that have experienced low back pain in the past three months has increased from 31.3 percent in 1997 to 35.4 percent in 2015.[1] Low back pain has also been a costly condition with an economic impact in the United States of over $100 billion in total costs per year.[2]

One treatment performed by physical therapists is spinal manipulative therapy (SMT). In a systematic review, Rubinstein et al[3] analyzed randomized controlled trials that examined the effectiveness of SMT or mobilization in adults with acute low back pain. SMT was compared to inert interventions, sham SMT, other interventions, and SMT as an additional therapy. The results showed no difference in back pain, back pain specific functional status, and perceived recovery when SMT was compared with inert interventions, sham SMT, or when SMT was added to another intervention. The researchers concluded that STM should not be utilized as a treatment option for low back pain.[3]

Alternatively, a randomized control trial by Balthazard et al[4] found that SMT combined with active exercise decreased low back pain. They compared patients with low back pain who received spinal manipulation/mobilization in addition to active exercise (MT+AE) or detuned ultrasound in addition to active exercise (ST). Immediately after completion of the manual therapy treatments, the MT+AE group reported better analgesic affects as compared to the ST group. Following the combined treatment, the participants in the MT+AE group presented with lower scores on the Oswestry disability index and reported lower pain scores compared to the ST group. The researchers concluded that manual therapy utilized in this manor was an appropriate treatment of nonspecific low back pain.[4]

While Rubinstein et[3] al concluded SMT should not be utilized as a treatment option for

low back pain, Balthazard et al[4] found that SMT resulted in decreased low back pain when in conjunction with active exercise as compared to exercise alone. In their randomized control trial, Balthazard et al examined the SMT techniques of passive accessory intervertebral movements, muscle-energy techniques, or high velocity low amplitude dynamic thrust manipulations. They did not include several other SMT techniques including manual lumbar traction. Therefore, the purpose of this case report is to investigate the effects of a combined therapy approach for treatment of low back pain with manual lumbar traction and therapeutic exercises as a part of a compressive physical therapy plan of care.

CASE DESCRIPTION

Patient History and Systems Review

The patient was a 48 year old female who worked as a library manager but was not working throughout the duration of treatment. She was referred to physical therapy by her orthopedic physician with a diagnosis of left sided degenerative joint disease (DJD)/degenerative disc disease (DDD). X-rays of the lumbosacral region indicated disc narrowing and mild facet atrophy at L5/S1. No spondylolysis or spondylolisthesis was evident. At the time of treatment she was seen for both her back and knee. It was determined that the two conditions were unrelated, so the focus of this case report was on the treatment intended to decrease low back pain and improve related function.

The patient had previous chiropractic treatment for her low back pain with minimal success in decreasing symptoms. She reported that anti-inflammatory drugs had decreased symptoms, but were no longer doing so at the time of the evaluation.

The patient presented at the physical therapy clinic with signs, symptoms, and clinical findings consistent with DJD and DDD. Lifting objects, squatting, walking down hill, and

walking for long durations were provocative of her symptoms. Her primary complaint was her inability to walk for long durations. The patient reported pain in the lumbar region greater on the left compared to the right. She complained of infrequent pain in her left gluteal region with radiation down her left proximal posterior lower extremity. There was no other relevant past medical history or any known relevant family past medical history. Her primary goals for physical therapy included decreasing pain levels and increasing activity. The patient signed consent to be a subject for this case report. Table 1 presents the results of the physical therapy systems review.

Clinical Impression 1

The patient's primary problem was pain in the lumbar area. All symptoms were felt greater on the left compared to the right. These symptoms inhibited her ability to maintain an active lifestyle. She also was unable to lift objects, squat, or walk downhill without increased low back pain which inhibited pain free activities of daily living.

The physical therapy diagnosis was determined to be left spine spondylosis without myelopathy or radiculopathy, lumbar region. The patient's signs and symptoms were consistent with this diagnosis. Spinal stenosis in the lumbar region and nucleus pulposus were considered for differential diagnosis. The plan for examination was formulated to further understand the patient's conditions, how her impairments related to function, and provided opportunity to measure progress throughout treatment. This plan included measuring pain levels, strength, range of motion, soft tissue mobility, functional mobility, and tenderness with palpation.

This patient was a good candidate for a case report due to limited available research on the use of a combined treatment approach of manual lumbar traction and therapeutic exercise for low back pain.

Examination – Tests and Measures

Range of motion, strength, tenderness to palpation, soft tissue mobility, and functional mobility were analyzed during the examination to better understand the patient's impairments, function, and mobility. It was determined that the patient had full active range of motion of the thoracolumbar spine but had pain with extension. Manual muscle testing for the lower extremity motions at the hip and knee as well as the transverse abdominis were completed as described by Kendall.[5] Manual muscle testing techniques have demonstrated excellent interrater and intrarater reliability.[5] Tenderness to palpation was measured as described by Magee.[6] Soft tissue mobility was analyzed on an ordinal scale with values that included no restriction, slight restriction, mild restriction, moderate restriction, and severe restriction. The reliability and validity of tenderness to palpation and muscle flexibility were unknown but deemed appropriate as they are commonplace in physical therapy practice. The patient's squatting mechanics and posture were also analyzed.

To better understand and quantify the patient's pain, a straight leg test and the Numeric Pain Rating Scale (NPRS) [8] were completed. The straight leg raise test was performed as described by Magee.[6] This test was completed in the supine position to improve the test's sensitivity for a lumber nerve root compression.[7] The patient completed the NPRS for pain at worst. The NPRS is a quick and simple self-report assessment that measures a patient's pain rating on an 11 point ordinal numeric scale. NPRS has been found to have minimal detectable change values, minimal clinically important difference values, and good responsiveness.[8]

The objective of the completed tests and measures were to greater understand the patient's impairments and how they related to her pain and function. See Table 2 for the results of the patient examination.

Clinical Impression 2

Based on the examination data collected, the signs, symptoms, and clinical findings supported the diagnosis of left sided DJD/DDD provided by the referring physician. These findings included increased pain with thoracolumbar extension, impaired lower extremity strength, impaired transverse abdominis strength, impaired soft tissue mobility, tenderness to palpation, negative straight leg raise, and 6/10 pain at worst on the NPRS. The patient continued to be appropriate for the case due to her motivation to participate in skilled physical therapy, severity of pain at worst, her symptoms' direct effect on ability to maintain an active lifestyle, and the number of impairments. Based on the patient presentation and examination clinical findings, the therapist planned to proceed with skilled physical therapy services.

The patient's symptoms, and clinical findings were consistent with a physical therapy diagnosis of ICD-10 code M47.816 Spondylosis without myelopathy or radiculopathy, lumbar region. The patient was given a good prognosis. Positive prognostic indicators for this patient included motivation to participate in physical therapy interventions and motivation to return to prior level of function. Also, research reports that patients with low back pain had favorable outcomes with most pain and related disability resolved within weeks.[9] Negative prognostic indicators included her onset age[9], gender[9], and chronic nature of symptoms.

The plan for this patient was participation in two physical therapy sessions per week for six weeks. Each treatment session lasted 45 to 60 minutes. There were no plans for referral at this time. The patient's orthopedic doctor was to be consulted as needed. The treatment plan for this patient included lower extremity strengthening exercises, abdominal stabilization exercises, neuromuscular reeducation training, soft tissue mobilization, manual traction, range of motion training, and patient education in a comprehensive home exercise program. Following the evaluation and examination, short term and long term goals were established for the patient

(Table 3). These outcomes were to be reevaluated at 3 weeks and 6 weeks following the initial evaluation.

INTERVENTIONS

Coordination, Communication, Documentation

The examination findings, proposed plan of care, and home exercise program were discussed with the patient. The patient's initial examination and subsequent treatments were documented utilizing an electronic medical record system. The electronic documentation was available to the referring physician and was available to the patient upon request.

Patient/Client related instruction

At the completion of the initial examination, the physical therapist discussed how these findings contributed to her condition and impairments. The patient was then educated on the role of physical therapy interventions in the achievement of her treatment goals. A home exercise program was also developed for the patient. Exercise demonstrations and knowledge of performance feedback was provided for the home exercise program exercises. A handout was provided to the patient that consisted of pictures and descriptions of each exercise which included performance, duration, and repetitions. The exercises that were completed with the home exercise program can be found in Table 5. The patient verbalized her understanding of the examination findings, plan of care, and home exercise program.

Procedural interventions

Physical therapy sessions were 45 to 60 minutes in duration and were completed two times per week. The therapy sessions started by asking the patient about changes in pain, function, compliance with the home exercise program, or anything else pertinent to the patient. The patient reported that she was compliant with the home exercise program throughout the

duration of treatment. The remaining time was spent performing therapeutic exercise and manual therapy interventions.

The manual techniques utilized included muscle stretching with active movement, soft tissue massage/mobilization, and manual traction. Muscle stretching with active movement was performed to reduce soft tissue mobility restrictions and each stretch was held for 30 seconds duration based on current literature.[10] Muscle stretching was a component of the home exercise program. Soft tissue massage/mobilization was used as a treatment with literature that supports its inclusion in treatment for low back pathologies.[11,12] This was discontinued after the first session as the patient reported that she did not believe it was helping with her symptoms and she wished to focus on other interventions. Manual lumbar traction was completed as described by Kaltenborn.[13] Manual lumbar traction was utilized to increase intervertebral space to decrease low back pain symptoms and completed throughout the duration of physical therapy at each session. This patient's non-involvement in manual work and no apparent fear avoidance behaviors increased the probability of response with the use of lumbar traction techniques.[14]

Therapeutic exercises were selected to improve the patient's impaired transverse abdominis strength, hip abduction strength, and squatting mechanics. Stationary cycling was also completed because low impact aerobic exercise increases blood flow and nutrients to soft tissue in the area of the spine which promotes healing.[15] Exercises were completed as a part of the home exercise program and during treatment sessions. The abdominal brace and abdominal brace with heel slide exercises were completed on the first day of treatment as they were a part of the home exercise program. The clamshell, bridging, and side step exercises were added to the program on the second day of treatment. The more challenging standing hip flexion, stationary bike, and standing abdominal brace exercises were added to the program on day six of treatment as she progressed with improved abdominal and hip abduction strength. These exercises started

to replace the previous exercises that were added on days one and two and were completed as tolerated. Exercises specific to each treatment session can be found in Table 4. Complete descriptions and images of therapeutic exercises and muscle stretches can be found in Table 5.

OUTCOME

The patient reported decreased pain and demonstrated improved function throughout the duration of care. She improved her NPRS score of 6/10 to 1/10 at worst and no longer had pain with thoracolumbar extension at the time of discharge. Her gross lower extremity manual muscle test scores increased to 5/5 bilaterally. Iliotibial band and piriformis flexibility improved to a slight restriction bilaterally. She no longer had tenderness upon palpation along the gluteus medius and piriformis bilaterally at discharge. She was also able to demonstrate a squat with proper technique and full range of motion, holding for five seconds at end range, and no report of increased pain. (Table 2)

At discharge, the patient reported increased activity without increased pain. All long term goals were achieved at the time of discharge. The patient believed she could continue to manage her symptoms independently by completing the exercises she learned in the clinic. She was instructed to contact her physical therapist if she had any questions or concerns following discharge.

DISCUSSION

This case study described the physical therapy management of a patient with low back pain which included manual lumber traction and therapeutic exercise. She reported reduced low back pain and demonstrated improved functional mobility throughout the course of physical therapy treatment. Factors that may have contributed positively to her outcomes included her

motivation, the interventions performed, her attendance of physical therapy sessions, and her ability to learn. The patient also reported decreased pain immediately following manual lumbar traction completed at the beginning of each session. This allowed her to complete exercises with less pain and better technique which may also have contributed positively to her outcomes. Factors that may have negatively affected her outcomes included her onset age[9], gender[9], and chronic nature of symptoms.

The comprehensive physical therapy plan of care for this patient included manual lumbar traction and therapeutic exercise. Lumbar traction is commonly used to treat low back pain to increase the intervertebral space and widen the intervertebral foramina.[16] Abdominal strengthening exercises were also utilized for this patient. According to Chang et al,[17] increasing core strength can assist in supporting the lumbar spine to decrease low back pain. Low impact aerobic exercise was another intervention performed by this patient. Aerobic exercise increases blood flow and nutrients to soft tissue in the area of the spine which promotes healing.[15] These aspects of care were intended to assist the patient in degreasing low back pain and activity tolerance and may have contributed to her successful outcomes.

The patient met all her short term goals with the exception of decreasing her pain score to 3/10. At three weeks of treatment, she reported 5/10 pain but she was having pain less frequently. She reported having her worst pain almost daily the first week of treatment and three to four times a week at the third week of treatment. She was able to meet all of her long term goals which included goals for decreasing pain, improving functional mobility, and increasing strength.

Low back pain can be a complicated condition with many factors contributing to the patient's symptoms. Therefore, each patient requires a comprehensive plan of care for their specific needs. A plan of care that included manual lumbar traction and therapeutic exercise

interventions was successful for this patient in decreasing low back pain. Future research with a greater sample size is necessary to generalize results to a larger population. In addition, other outcome measures could have been helpful to determine how low back pain was related to function. The Oswestry Disability Index is an assessment, with excellent test retest reliability, that measures disablement and how much back or leg pain impacts functional activities.[18] In addition, this patient had a successful outcome at the completion of treatment but further research with a longer duration is needed to determine the potential long term benefits of this treatment.

REFERENCES

1. National Center for Health Statistics. Health, United States, 2016: With chartbook on long-term trends in health. Centers for Disease Control and Prevention Web site. https://www.cdc.gov/nchs/data/hus/hus16.pdf. Accessed Jul 15, 2017.

2. Crow WT, Willis DR. Estimating cost of care for patients with acute low back pain: A retrospective review of patient records. *J Am Osteopath Assoc*. 2009;109(4):229-233. Accessed Jul 16, 2017.

3. Rubinstein SM, Terwee CB, Assendelft WJJ, Boer, M R M de, Tulder MWv. Spinal manipulative therapy for acute low-back pain (review). *Cochrane Database of Systematic Reviews*. 2012(9):Art.No.: CD008880. http://www.narcis.nl/publication/RecordID/oai:repository.ubn.ru.nl:2066%2F109576. Accessed Jun 4, 2017. doi: 10.1002/14651858.CD008880.pub2.

4. Balthazard P, de Goumoens P, Rivier G, Demeulenaere P, Ballabeni P, Dériaz O. Manual therapy followed by specific active exercises versus a placebo followed by specific active exercises on the improvement of functional disability in patients with chronic non specific low back pain: A randomized controlled trial. *BMC Musculoskelet Disord*. 2012;13:162. Accessed Jul 15, 2017. doi: 10.1186/1471-2474-13-162.

5. Kendall FP, McCreary EK, Provance PG, Rodgers MM, Romani WA. Muscle testing and function with posture and pain. 5th ed. Baltimore, MD: Lippincott Williams & Wilkins; 2005.

6. Magee DJ. Orthopedic physical assessment. 6th ed. Saint Louis: Saunders; 2014.

7. Childs JD, Piva SR, Fritz JM. Responsiveness of the numeric pain rating scale in patients with low back pain. *Spine*. 2005;30(11):1331-1334. Accessed Jun 10, 2017. doi: 10.1097/01.brs.0000164099.92112.29

8. Oswestry low back pain scale. Spine Research Institute of San Diego Web site. http://www.srisd.com/Oswestry%20Low%20Back%20Pain%20Scale.pdf.

9. B W Koes, M W van Tulder, S Thomas. Diagnosis and treatment of low back pain. *British Medical Journal*. 2006;332(7555):1430-1434. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1479671/ . Accessed Jun 25, 2017. doi: 10.1136/bmj.332.7555.1430.

10. Page P. Current concepts in muscle stretching for exercise and rehabilitation. *Int J Sports Phys Ther*. 2012;7(1):109-19. Accessed Jul 9, 2017 http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3273886/.

11. Furlan AD, Imamura M, Dryden T, Irvin E. Massage for low-back pain. *Cochrane Database Syst Rev*. 20015;(4):CD001929. Accessed Jul 9, 2017 doi: 10.1002/14651858.CD001929.pub2.

12. Branchini M, Lopopolo F, Andreoli E, et al. Fascial Manipulation for chronic aspecific low back pain: a single blinded randomized controlled trial. F1000Research. 2015;4:1208. Accessed Jul 9, 2017. doi:10.12688/f1000research.6890.2.

13. Kaltenborn F. Manual mobilization of the joint volume II the spine. 12th ed. Oslo, Norway: Norli; 2012.

14. Cai C, Pua YH, Lim KC. A clinical prediction rule for classifying patients with low back pain who demonstrate short-term improvement with mechanical lumbar traction. *Eur*

Spine J. 2009;18(4):554-561. Accessed Jul 9, 2017. doi: 10.1007/s00586-009-0909-9.

15. Gordon R, Bloxham S. A systematic review of the effects of exercise and physical activity on non-specific chronic low back pain. *Healthcare (Basel, Switzerland).* 2016;4(2):22. http://www.ncbi.nlm.nih.gov/pubmed/27417610. Accessed Oct 30, 2017. doi: 10.3390/healthcare4020022.
16. Pellecchia GL. Lumbar traction: A review of the literature. *The Journal of orthopaedic and sports physical therapy*. 1994;20(5):262-267. http://www.ncbi.nlm.nih.gov/pubmed/7827634. Accessed Oct 30, 2017. doi: 10.2519/jospt.1994.20.5.262.
17. Chang W, Lin H, Lai P. Core strength training for patients with chronic low back pain. *Journal of Physical Therapy Science*. 2015;27(3):619-622. https://jlc.jst.go.jp/DN/JLC/20008185783?from=SUMMON. Accessed Oct 30, 2017. doi: 10.1589/jpts.27.619.
18. Oswestry disability index. AbilityLab Web site. https://www.sralab.org/rehabilitation-measures/oswestry-disability-index. Accessed Oct 30, 2017.
19. HEP2go HEP for rehab pros. HEP2go Web site. Accessed Oct 31, 2017.

TABLES and FIGURES

Table 1. Systems Review

Cardiovascular/Pulmonary	Not impaired
Musculoskeletal	Impaired: Lower Extremity active and passive range of motion- within functional limits Lower Extremity Gross Strength- -4/5 to 4/5 strength bilaterally Abdominal strength- week transverse abdominis Thoracolumbar range of motion- full range of motion and increased pain with extension Palpation- decreased soft tissue mobility of the bilateral piriformis, iliotibial band, and hamstrings, tenderness with palpation of the bilateral gluteus medias and piriformis Posture- mild right lordosis and anterior pelvic tilt
Neuromuscular	Impaired: Patient presented with sciatic neural tension symptomology despite negative straight leg raise test bilaterally. Lower extremity reflex/sensory integrity- intact and equal bilaterally. Balance- impaired standing balance in single leg stance bilaterally
Integumentary	Not impaired
Communication	Not impaired
Affect, Cognition, Language, Learning Style	Not Impaired: The patient had good affect and was alert and oriented X3. The patient did not have any observable learning or language barriers. The preferred learning style of the patient was though verbal instruction, demonstration, and pictures.

387 **Table 2. Tests and Measures**

Tests & Measures	**Initial Evaluation Results**		**Week 3 Results**		**Week 6 Results**	
Active Range of Motion						
Thoracolumbar	Full ROM Pain increased with extension		Full ROM No Pain with Any Motion		Full ROM No Pain with Any Motion	
Manual Muscle Testing	**Left**	**Right**	**Left**	**Right**	**Left**	**Right**
Hip Abduction	-4/5	-4/5	4/5	4/5	+4/5	+4/5
Hip Adduction	4/5	4/5	+4/5	+4/5	5/5	5/5
Hip Extension	4/5	4/5	+4/5	+4/5	5/5	5/5
Hip Flexion	4/5	4/5	+4/5	+4/5	5/5	5/5
Hip External Rotation	4/5	4/5	+4/5	+4/5	5/5	5/5
Hip Internal Rotation	4/5	4/5	+4/5	+4/5	5/5	5/5
Knee Extension	4/5	4/5	+4/5	+4/5	5/5	5/5
Knee Flexion	4/5	4/5	+4/5	+4/5	5/5	5/5
Transverse Abdominis	-4/5		4/5		+4/5	
Flexibility Restriction	**Left**	**Right**	**Left**	**Right**	**Left**	**Right**
Piriformis	Moderate	Moderate	Mild	Mild	Slight	Slight
Iliotibial Band	Mild	Mild	Mild	Mild	Slight	Slight
Hamstrings	Moderate	Moderate	Mild	Mild	Slight	Slight
Pain with Palpation	**Left**	**Right**	**Left**	**Right**	**Left**	**Right**
Gluteus Medias Right	Grade II-Pain with Wincing	Grade II-Pain with Wincing	Grade I-Complaint of Pain	Grade I-Complaint of Pain	None	None
Piriformis Right	Grade II-Pain with Wincing	Grade II-Pain with Wincing	Grade I-Complaint of Pain	Grade I-Complaint of Pain	None	None
Squatting	Patient demonstrated squat with knees anterior to toes at end of motion and complaint of an increased lumbar pain.		Patient demonstrated squat with proper mechanics and full range of motion without an increase in pain.		Patient demonstrated squat with proper mechanics and full range of motion and able to hold for 5 seconds without an increase in pain.	
Straight Leg Raise	Negative		Negative		Negative	
Numeric Pain Rating Scale (NPRS)						
Pain at Worst	6/10		5/10		1/10	

388 **Table 3. Plan of Care Goals**

Short Term Goals: Patient to demonstrate in 3 weeks of treatment: 1) Low back pain will decrease to 3/10 at worst as measured by the NPRS in order to improve quality of life. 2) Perform a single squat with good mechanics with full range of motion without increased pain for improved daily function 3) Improve lower extremity strength manual muscle testing to +4/5 bilaterally.
Short Term Goals: Patient to demonstrate in 6 weeks of treatment: 1) Low back pain will decrease to 1/10 at worst as measured by the NPRS in order to improve quality of life. 2) Perform a single squat with good mechanics with full range of motion and hold for 5 seconds without increased pain for improved daily function 3) Improve lower extremity strength manual muscle testing to 5/5 bilaterally.

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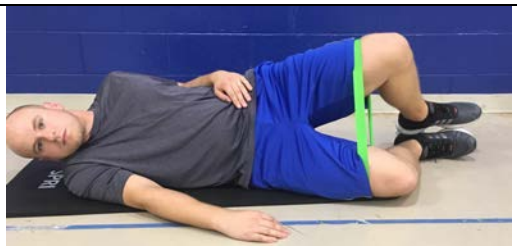
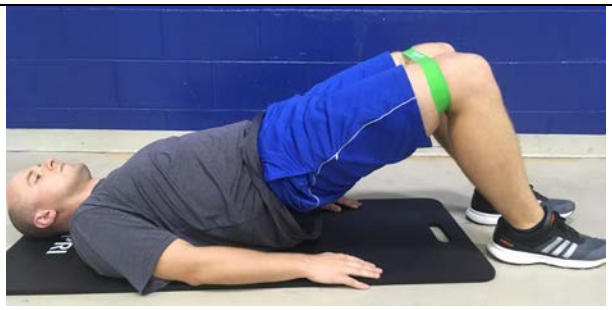
Table 4. Interventions

	Rx Day 1- following evaluation	Rx Day 2	Rx Day 3	Rx Day 4	Rx Day 5	Rx Day 6	Rx Day 7	Rx Day 8	Rx Day 9	Rx Day 10	Rx Day 11
Intervention 1- Soft tissue massage/mobilization to the gluteus medias, piriformis, and iliotibial band	X										
Intervention 2- Manual Lumbar Traction in supine hook lying position	X	X	X	X	X	X	X	X	X	X	X
Intervention 3- Abdominal Brace	X	X	X	X	X	X	X	X			
Intervention 4- Abdominal Brace with Heel Slides	X	X	X	X	X	X					
Intervention 5- Clamshell Exercise		X	X	X	X	X	X				
Intervention 6- Bridging Exercise		X	X	X	X	X	X	X			
Intervention 7- Side Steps		X	X	X	X	X	X	X	X	X	X
Intervention 8- Standing Hip Flexion						X	X	X	X	X	X
Intervention 9- Stationary Bike						X			X	X	X
Intervention 10- Standing abdominal Brace with P-Press, One Arm Row, and Across Body Chop							X	X	X	X	X

405 **Table 5. Therapeutic Exercises and Muscle Stretching Techniques**

Intervention	Image
Abdominal Brace- Perform this exercise in supine hook lying position. Tighten abdominals as if a bowling ball were about to be dropped on abdomen. Be sure to not hold your breath. Do not tighten abdominals in a way that will change the neutral position of the spine. Complete 30 repetitions with 5 seconds holds and 2 seconds rest between each repetition. This exercise was completed as a part of the home exercise program.	
Abdominal Brace with Heel Slides- Perform this exercise in hook lying position. Slowly slide your heel forward on the floor/bed and then slide it back. Use your stomach muscles to keep your spine from moving out of a neutral position. Complete 3 sets of 10 repetitions. This exercise was completed as a part of the home exercise program.	
Clamshell Exercise- Perform this exercise with a circular band above the knees. Lay on side with the hip performing the exercise on top. Shoulders, hips, and ankles should all be aligned and remain aligned throughout exercise. Knees are bent to approximately 90 degrees and brought in front of the body. Lift top knee towards ceiling and pause before slowly returning to starting position. Complete 3 sets of 10 repetitions.	
Bridging Exercise- Perform exercise in hook lying position with a circular band above the knees and pull knees apart. Then tighten your lower abdominals, squeeze your buttocks, and raise your buttocks off the floor/bed as creating a "Bridge" with your body. Complete 3 sets of 10 repetitions.	

Standing Abdominal Brace with P-Press- Anchor a sport cord on the wall at chest height. Stand with an athletic squatting stance, facing perpendicular to the wall, and holding the sport cord at the center of your chest. The athletic squatting stance includes maintaining knees directly above ankles, knees bent, and upright posture. Tighten your lower abdominals and slowly push the cord straight out and back. Perform 3 sets of 10 repetitions facing each direction.	
Standing Abdominal Brace with One Arm Row- Anchor a sport cord on the wall at chest height. Tighten your abdominals and pull the sport cord straight back with one arm while in an athletic squatting stance. Maintain hips and shoulders facing the wall without rotating. Perform 3 sets of 10 repetitions with each arm.	
Standing Abdominal Brace with Across Body Chop- Anchor a sport cord on the wall at your height. Tighten your abdominals and pull the cord from head height on the wall side to your hip on the opposite side while maintaining your hips and shoulders facing perpendicular to the wall. Maintain an athletic squatting position throughout the exercise. Perform 3 sets of 10 repetitions facing each direction.	

Standing Hip Flexion- Anchor a sport cord to the wall at hip height. Line up perpendicular to the wall and wrap the sport cord on the leg furthest from the wall just above the knee. Slowly lift the knee to hip height without letting the band pull your knee out of alignment with your hip and slowly return your foot to the ground. Perform 3 sets of 10 repetitions facing both directions.	
Side Steps- Performed this exercise with circular band above ankles. Take steps to the side while keeping your feet spread apart and toes pointed forward. Maintain an athletic squatting position throughout the exercise. Step 30 feet to the left and 30 feet to the right. Perform this 3 times.	 
Seated Piriformis Stretch- While sitting in a chair, cross your affected leg on top of the other as shown. Next, gently lean forward until a stretch is felt along the crossed leg. Hold the stretch for 30 seconds and 3 repetitions for each leg. This muscle stretch was completed as a part of the home exercise program.	 19

Standing Tensor Fasciae Latae and Iliotibial Band Stretch- Stand with your side next to a wall. Place you opposite foot behind your foot closest to the wall. Use the wall for balance. The push your hips forward and away from the wall. The stretch should be felt in the side of the outside hip. Hold the stretch for 30 seconds and 3 repetitions for each side. This muscle stretch was completed as a part of the home exercise program.	 19

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